**INCH-POUND** 

MIL-STD-1276E

18 May 1993

SUPERSEDING MIL-STD-1276D 28 JANUARY 1987

# **MILITARY STANDARD**

LEADS FOR ELECTRONIC COMPONENT PARTS



AMSC N/A FSC 5999
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

## DEPARTMENT OF DEFENSE Washington, DC 20360

# Leads for Electronic Component Parts

- 1. This standard is approved for use by all Departments and Agencies of the Department of Defense.
- 2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U. S. Army Research Laboratory Command, Electronics and Power Sources Directorate/ARL, Reliability and Manufacturing Science Division, ATM: AMSRL-EP-ED, Fort Mormouth, NJ 07703-5601 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

# CONTENTS

1. SCOPE- 1.1 Purpose 1 1.2 Classification- 1 1.2.1 Type designation- 1 1.2.1.1 Cross section 1 1.2.1.2 Nominal size- 1 1.2.1.3 Composition 1 1.2.1.4 Final finish- 1 1.2.1.5 Underplating- 1 1.2.1.5 Underplating- 1 2. APPLICABLE DOCUMENTS 3 2.1 Government documents 3 2.1 Specifications, standards, and handbooks 3 2.2 Non-Government publications 3 2.3 Order of precedence 4 3. DEFINITIONS (Not applicable) 5 4. GENERAL REQUIRMENTS 6 4.1 Preferred methods of assembly 6 4.2 Solderability 7 4.3 Thickness 7 4.4 Adhesion- 7 4.5 Porosity- 7 4.6 Workmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 7 5.2 Final finish- 8 5.2 Final finish- 8 5.2 In Composition 8 5.2 Final finish- 8 5.2.1.1 Codd plating- 9 5.2.1.2 Compositions 7, G, and K- 9 5.2.1.3 Not solder dip- 9 5.2.1.4 Compositions A, B, J, and X- 9 5.2.1.5 Compositions A, B, J, and X- 9 5.2.1.6 Compositions A, B, J, and X- 9 5.2.1.7 Compositions A, B, J, and X- 9 5.2.1.8 Compositions A, B, J, and X- 9 5.2.1.9 Compositions A, B, J, and X- 9 5.2.1.1 Compositions A, B, J, and X- 9 5.2.1.2 Compositions A, B, J, and X- 9 5.2.1.3 Not solder dip- 9 5.2.1.4 Compositions A, B, J, and X- 9 5.2.1.5 Not solder dip- 10 6.5 Removal of sold plating before soldering- 10 6.5 Removal of sold plating before soldering- 10 6.5 Subject tern (Key word) listing- 12 6.6 Subject tern (Key word) listing- 12 6.8 Charges fron previous issue 12  IABLES  Table II Nominal size- 1 Table II Preferred methods of assembly 6 Table III Cross reference of lead types- 10	PARAGRAPH	PAG
1.1	1.	COPE
1.2   Classification		
1.2.1 Type designation 1.2.1.1 Cross section 1.2.1.2 Nominal size 1.2.1.3 Composition 1.2.1.4 Final finish 1.2.1.5 Underplating 1.2.1.5 Underplating 1.2.1.6 Government documents 2.1 Government documents 2.1.1 Specifications, standards, and handbooks 3.2.2 Mon-Government publications 3.3 Order of precedence 4.0 Order of precedence 4.1 Preferred methods of assembly 4.1 GENERAL REQUIREMENTS 4.2 Solderability 4.3 Thickness 4.4 Adhesion 4.5 Porosity 4.6 Morkmanship in finishes 5. DETAILED REQUIREMENTS 5. DETAILED REQUIREMENTS 5. DETAILED REQUIREMENTS 5. Composition 5.2 Final finish 5.3 Final finish 5.4 Composition 5.5 Final finish 5.6 Solder dip 5.7 Composition 6.8 Solder dip 6.8 Solder dip 6.9 Solder dip 6.0 Compositions F, G, and K 6.0 Solder dip 6.1 Precaution 6.2 Removal of gold plating before soldering 6.4 Cross reference 6.5 Cleantiness 6.6 Supersession data 6.7 Subject term (key word) listing 6.8 Chaple III Preferred methods of assembly 6.7 Table II Nominal size 7 Table II Preferred methods of assembly 7 Solde III Preferred methods of assembly 8 Solde III Preferred metho	1.2	17.5711
1.2.1.1 Cross section 1.2.1.2 Nominal size- 1.2.1.3 Composition - 1.2.1.4 Final finish- 1.2.1.5 Underplating- 1.2.1.5 Underplating- 1.2.1.6 Government documents- 2.1 Government documents- 3.1.1 Specifications, standards, and handbooks- 3.2.2 Non-Government publications 3.3 Order of precedence- 3. DEFINITIONS (Not applicable)- 4. GENERAL REQUIREMENTS- 4. Perferred methods of assembly- 4.2 Solderability- 7.4.3 Thickness- 7.4.4 Adhesion- 7.4.5 Porosity- 7.5 Porosity- 7.6 Workmanship in finishes 7.7 DEFINITIONS (Not applicable)- 8.5 DEFINITIONS (Not applicable)- 8.5 DEFINITIONS (Not applicable)- 8.5 Porosity- 9.5 P		
1.2.1.2   Nominal size		
1.2.1.3 Composition 1 1.2.1.4 Final finish 1.2.1.5 Underplating 1 1.2.1.5 Underplating 1 1.2.1.5 Underplating 1 2. APPLICABLE DOCUMENTS 3 2.1 Government documents 3 2.1 Specifications, standards, and handbooks 3 2.2 Mon-Government publications 3 2.3 Order of precedence 4 3. DEFINITIONS (Not applicable) 5 4. GENERAL REQUIREMENTS 6 4.1 Preferred methods of assembly 6 4.2 Solderability 7 4.3 Thickness 7 4.4 Adhesion 7 4.5 Porosity 7 4.6 Morkmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 7 5.2 Final finish 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Composition 8, G, and K- 9 5.2.1.3 Not solder dip 9 5.2.1.4 Compositions A, B, J, and 3 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 IABLES  Table I Nominal size 12 Table II Preferred methods of assembly 10 6 Table III Preferred methods of assembly 10		
1.2.1.5 Underplating-  2. APPLICABLE DOCUMENTS		
1.2.1.5 Underplating-  2. APPLICABLE DOCUMENTS- 2.1 Government documents- 3. 2.1.1 Specifications, standards, and handbooks- 3. 2.2 Mon-Government publications 3. 3. Order of precedence- 4. 3. DEFINITIONS (Not applicable)- 5. GENERAL REQUIREMENTS- 6. 1 Preferred methods of assembly- 6. 2 Solderability- 7. 4.3 Thickness- 7. 4.4 Achesion- 7. 4.5 Porosity- 7. 4.6 Workmanship in finishes- 7. 5. DETAILED REQUIREMENTS- 8. 5.1 Composition- 8. 5.2.1 Underplating thickness- 9. 5.2.1.1 Gold plating- 9. 5.2.1.2 Compositions F, G, and K- 9. 5.2.1.3 Not solder dip- 9. 5.2.1.4 Compositions A, B, J, and X- 9. 5.2.1.4 Compositions A, B, J, and X- 9. 6. NOTES- 6.1 Precaution- 6.2 Removal of gold plating before soldering- 6.3 Passive nickel- 6.4 Cross reference- 6.5 Supersession data 6.6 Supersession data 6.7 Subject term (key word) listing- 6.8 Changes fron previous issue-  Table II Nominal size- 7 Table II Nominal size- 7 Table III Preferred methods of assembly- 7 Table II		
2. APPLICABLE DOCUMENTS 3 2.1 Government documents 3 2.1 Specifications, standards, and handbooks 3 2.2 Mon-Government publications 3 2.3 Order of precedence 4 3. DEFINITIONS (Not applicable) 5 4. GENERAL REQUIREMENTS 6 4.1 Preferred methods of assembly 7 4.2 Solderability 7 4.3 Thickness 7 4.4 Adhesion 7 4.5 Porosity 7 4.6 Morkmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 8 5.2 Final flinish 8 5.1 Composition 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Mot solder dip 9 5.2.1.4 Compositions F, G, and K 9 5.2.1.5 More solder dip 9 5.2.1.6 Composition 9 5.2.1.7 Composition 9 5.2.1.8 Composition A, B, J, and ⅓ 9 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 11 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Table II Nominal size 12 Table II Nominal size 12 Table III Preferred methods of assembly 10 6 Table III Pref		1.1111111111111111111111111111111111111
2.1 Government documents 2.1.1 Specifications, standards, and handbooks 3.2.2 Mon-Government publications 3. Order of precedence 4. GENERAL REQUIREMENTS 4. GENERAL REQUIREMENTS 4.1 Preferred methods of assembly 6.2 Solderability 77 6.4 Adhesion 77 6.5 Porosity 77 6.6 Workmanship in finishes 7. Order of precedence 7. DETAILED REQUIREMENTS 8. OETAILED REQUIREMENTS 8. 1. Composition 8. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	1.2.1	o underplating
2.1.1   Specifications, standards, and handbooks   3   2.2   Mon-Government publications   3   3   2.3   Order of precedence   4   4   4   4   4   4   4   4   4		
2.2   Non-Government publications   3   2.3   Order of precedence   4   4   3   Order of precedence   5   4   3   OFFINITIONS (Not applicable)   5   5   4   GENERAL REQUIREMENTS   6   6   1   Preferred methods of assembly   6   4.2   Solderability   7   7   4.3   Thickness   7   7   4.4   Adhesion   7   7   7   4.5   Porosity   7   7   7   4.6   Workmanship in finishes   7   7   7   7   7   7   7   7   7		Government documents
2.3 Order of precedence		Specifications, standards, and handbooks
3. DEFINITIONS (Not applicable) 5 4. GENERAL REQUIREMENTS 6 4.1 Preferred methods of assembly 6 4.2 Solderability 7, 7 4.3 Thickness 7, 7 4.4 Achesion 7, 7 4.5 Porosity 7, 7 4.6 Workmanship in finishes 7, 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 8 5.2 Final finish 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating - 9 5.2.1.2 Compositions 7, 6, and K 9 5.2.1.3 Not solder dip 9 5.2.1.4 Compositions A, B, J, and J 9 5.2.1.4 Compositions A, B, J, and J 9 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Changes fron previous issue 12  IABLES  Table I Nominal size 2 Table II Preferred methods of assembly 6 Table III Preferred methods of assembly 10 6.5 Table III Preferred methods of assembly 10 6.7		Non-Government publications
4. GENERAL REQUIREMENTS 6 4.1 Preferred methods of assembly 6 4.2 Solderability 7 4.3 Thickness 7 4.4 Adhesion 7 4.5 Porosity 7 4.6 Morkmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 8 5.2 Final finish 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Hot solder dip 9 5.2.1.4 Compositions A, B, J, and ) 9 5.2.1.4 Compositions A, B, J, and ) 9 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 1 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Charges fron previous issue 12  IABLES  Table II Nominal size 12 Table II Preferred methods of assembly 16 6 Table III Preferred of Leave 17 6 Table III	2.3	Order of precedence 4
4.1 Preferred methods of assembly	3.	PEFINITIONS (Not applicable) 5
4.1 Preferred methods of assembly	4	ENEDAL DECLIDEMENTS
4.2 Solderability		
4.3 Thickness - 7 4.4 Adhesion - 7 4.5 Porosity - 7 4.6 Workmanship in finishes - 7 5. DETAILED REQUIREMENTS - 8 5.1 Composition - 8 5.2 Final finish - 8 5.2.1 Underplating thickness - 9 5.2.1.1 Gold plating - 9 5.2.1.2 Compositions F, G, and K - 9 5.2.1.2 Compositions F, G, and K - 9 5.2.1.4 Compositions A, B, J, and X - 9 6. MOTES - 10 6.1 Precaution - 10 6.2 Removal of gold plating before soldering - 10 6.3 Passive nickel - 10 6.4 Cross reference - 10 6.5 Cleanliness - 11 6.6 Supersession data - 11 6.7 Subject term (key word) listing - 12 Changes from previous issue - 12  Table II Nominal size - 12 Table II Nominal size - 10 Table III Preferred methods of assembly - 10		
4.4 Achesion 7 4.5 Porosity 7 4.6 Workmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 8 5.2 Final finish 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating - 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Hot solder dip 9 5.2.1.4 Compositions A, B, J, and J 9 6. NOTES 9 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Changes from previous issue 12  IABLES  Table I Nominal size 2 Table II Preferred methods of assembly 6 Table III Preferred methods of assembly 6 Table III Preferred methods of assembly 7 5. DETAILED 7 7 8 8 9 9 10 10 10 10 11 10 11 10 11 10 11 11 11		
4.5 Porosity- 7 4.6 Workmanship in finishes 7 5. DETAILED REQUIREMENTS 8 5.1 Composition 8 5.2 Final finish- 8 5.2.1 Underplating thickness- 9 5.2.1.1 Gold plating- 9 5.2.1.2 Compositions F, G, and K- 9 5.2.1.2 Compositions F, G, and K- 9 5.2.1.4 Compositions A, B, J, and X- 9 6. NOTES - 10 6.1 Precaution- 10 6.2 Removal of gold plating before soldering- 10 6.3 Passive nickel- 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 11 6.8 Changes from previous issue 12  TABLES  Table I Nominal size- 2 Table II Preferred methods of assembly 6 Table III Preferred of lead types 10		,
4.6 Workmanship in finishes		· · · · · · · · · · · · · · · · · · ·
5. DETAILED REQUIREMENTS 8 5.1 Composition - 8 5.2 Final finish - 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating - 9 5.2.1.2 Compositions F, G, and K - 9 5.2.1.3 Mot solder dip - 9 5.2.1.4 Compositions A, B, J, and ≯ 9 6. NOTES - 10 6.1 Precaution - 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel - 10 6.4 Cross reference 10 6.5 Cleanliness - 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Charges from previous issue 12  IABLES  Table I Nominal size 2 Table II Nominal size 2 Table III Preferred methods of assembly 6 Table III Preferred methods of assembly 6 Table III Preferred of lead types 10		
5.1 Composition 8 5.2 Final finish 8 5.2.1 Inderplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Mot solder dip 9 5.2.1.4 Compositions A, B, J, and X 9 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Changes from previous issue 12  IABLES  Table II Nominal size 2 Table II Preferred methods of assembly 2 Table III Preferred methods of assembly 30 Table III Preferred of Lead types 10	4.0	workmanship in finishes 7
5.1 Composition 8 5.2 Final finish 8 5.2.1 Inderplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Mot solder dip 9 5.2.1.4 Compositions A, B, J, and X 9 6. NOTES 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Changes from previous issue 12  IABLES  Table II Nominal size 2 Table II Preferred methods of assembly 2 Table III Preferred methods of assembly 30 Table III Preferred of Lead types 10	5.	DETAILED REQUIREMENTS
5.2 Final finish 8 5.2.1 Underplating thickness 9 5.2.1.1 Gold plating 9 5.2.1.2 Compositions F, G, and K 9 5.2.1.3 Hot solder dip 9 5.2.1.4 Compositions A, B, J, and X 9 6. NOTES - 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness - 11 6.6 Supersession data 11 6.7 Subject tern (key word) listing 12 6.8 Charges fron previous issue 12  TABLES  Table II Nominal size 2 Table II Preferred methods of assembly 2 Table III Preferred methods of assembly 5 Table III Preferred methods of assembly 7		
5.2.1 Underplating thickness 9 5.2.1.1 Gold plating - 9 5.2.1.2 Compositions F, G, and K- 9 5.2.1.3 Not solder dip 9 5.2.1.4 Compositions A, B, J, and X 9 6. NOTES - 10 6.1 Precaution 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness 11 6.6 Supersession data 11 6.7 Subject term (key word) listing 12 6.8 Changes from previous issue 12  IABLES  Table I Nominal size 2 Table II Preferred methods of assembly 2 Table III Preferred methods of assembly 30 Torss reference 10 Table III Preferred methods of assembly 30 Table II	5.2	
5.2.1.1 Gold plating		Underplating thickness
5.2.1.2 Compositions F, G, and K- 9 5.2.1.3 Hot solder dip- 9 5.2.1.4 Compositions A, B, J, and N- 9 6. NOTES - 10 6.1 Precaution- 10 6.2 Removal of gold plating before soldering 10 6.3 Passive nickel- 10 6.4 Cross reference 10 6.5 Cleantiness - 11 6.6 Supersession data 11 6.7 Subject tern (key word) listing 12 6.8 Charges from previous issue 12  IABLES  Table I Nominal size- 2 Table II Preferred methods of assembly 2 Table III Preferred methods of assembly 36 Table III Preferred of lead types 36	5.2.1	Gold plating
5.2.1.3 Not solder dip	5.2.1	
5.2.1.4 Compositions A, B, J, and X	5.2.1	
6.1 Precaution		
6.1 Precaution	4	HOTER
6.2 Removal of gold plating before soldering		NOIES 10
6.3 Passive nickel 10 6.4 Cross reference 10 6.5 Cleanliness - 11 6.6 Supersession data 11 6.7 Subject tern (key word) listing 12 6.8 Charges from previous issue 12  TABLES  Table I Nominal size 2 Table II Preferred methods of assembly 6 Table III Preferred methods of assembly 10 Table III Preferred of lead types 10		Precaution 10
6.4 Cross reference		Removal of gold plating before soldering 10
6.5 Cleanliness - 11 6.6 Supersession data - 11 6.7 Subject term (key word) listing - 12 6.8 Charges from previous issue - 12  TABLES  Table I Nominal size - 2 Table II Preferred methods of assembly - 6 Table III Cross reference of lead types - 10		Passive nickel 10
6.6 Supersession data		Cross reference 10
6.7 Subject term (key word) listing		Cleanliness
6.8 Charges from previous issue		Supersession data
TABLES  Table I Nominal size 2 Table II Preferred methods of assembly 6 Table III Cross reference of lead types 10		Subject term (key word) listing 12
Table I Nominal size 2 Table II Preferred methods of assembly	6.8	Changes from previous issue 12
Table II Preferred methods of assembly 6 Table III Cross reference of lead types 10	TABLES	
Table II Preferred methods of assembly 6 Table III Cross reference of lead types 10	Table	Noninal size
Table III Cross reference of lead types 10	Table	I Preferred methods of assembly
Table IV Supersession data for final finishes	Table	II Cross reference of lead types 10
	Table	V Supersession data for final finishes

#### VII.-STD-1276E

#### 1. SCOPE

1.1 <u>Purpose</u>. This standard establishes the method of identifying, specifying, and limiting to a minimum the combinations of basic materials, the thickness and composition of the plating used therewith, and the sizes of wire and flat wire (ribbon) leads on electronic and electrical parts when they are to be soldered or velded during assembly in equipment.

## 1.2 Classification.

1.2.1 Type designation. The type designation shall be in the following format:



- 1,2.1.1 Cross section. The lead cross section shall be identified by a single letter symbol as follows:
  - R Rectangular.
  - S Square.
  - W Wire (round or circular).
  - X Other (as specified).
- 1.2.1.2 <u>Mominal size</u>. The less size shall be identified by the nominal diameter or nominal diagonal in millimeters (within parentheses) or inches (without parentheses). See table I for a list of suggested nominal sizes.
- 1.2.1.3 <u>Composition</u>. The lead composition shall be identified by a single letter symbol as specified in 5.1.
- 1.2.1.4 <u>Final finish</u>. The final finish for leads shall be identified by a two-number code as specified in 5.2.
- 1.2.1.5 <u>Underplating</u>. The underplating type and thickness shall be identified by a one or two digit alpha-numeric code as specified in 5.2.1.

1

TABLE I. Nominal size (for information only).

Wire size AWG (B and S)	Diameter in inches	Diameter in millimeters
1	0.289	7.34
2 3 4 5 6 7 8	0.257	6.53
3	0.229	5.82
4	0.204	5.18
,	0.181	4.60 4.11
9	0.152 0.164	3.65
(	0.144	3.65
8	0.120	2.90
10	0.101	2.57
11	0.090	2.29
12	0.080	2.03
13	0.072	1.83
14	0.054	1.63
15	0.057	1.45
16	0.050	1.27
17	0.045	1.14
18	0.040	1.02
19	0.035	0.89
20	0.032	0.81
21	0.028	0,71
22	0.025	0.64
23	0.022	0.56
24	0.020	0.51
25	0.017	0.43
26	0.015	0.38
27	0.014	0.36
28	0.012	0.30
29	0.011	0.28
30	0.010	0.25
31	0.008	0.20
32 33	0.008	0.20
33 34	0.007	0.18
34 35	0.036 0.035	0.15 0.13
36	0.005	0.13
36 37	0.004	0.13
38	0.004	0.10
39	0.004	0.08
40	0.003	0.08

#### MII - STO - 1276F

#### 2. APPLICABLE DOCUMENTS

#### 2.1 Government documents.

2.1.1 <u>Specifications, standards, and handbooks</u>. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (CODISS) and supplement thereto, cited in the solicitation.

#### SPECIFICATIONS.

## FEDERAL

- QQ-N-290 · Nickel Plating (Electrodeposited).
- Silver Plating, Electrodeposited; General Requirements for.
- QQ-S-571 Solder, Tin Alloy: Tin-Lead Alloy: and Lead Alloy.

#### MILITARY

- Tin Plating: Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals. MIL-7-10727 -
- MIL-C-14550 -
- Copper, Plating Electrodeposited.
  Coatings, Electroless Nickel, Requirements for. MIL-C-26074
- MIL-6-45204 Gold Plating, Electrodeposited. Nickel Bar, Flat Wire (Ribbon) and Strip (for Electronic Use).
- MIL-N-46025 -MIL-W-46026 -Nickel Rod and Wire (Round) (for Electronic Use).
- MIL-P-81728 -Plating, Tin-lead (Electrodeposited).

#### STANDARDS

#### MILITARY

- MIL-STD-202 Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-750 Test Methods for Semiconductor Devices.
  MIL-STD-883 Test Methods and Procedures for Microelectronics.

(Unless otherwise indicated, copies of the federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bui.ding 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5034.)

2.2 <u>Non-Government publications</u>. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTW)

- ASTM R5
- Standard Specification for Electrolytic Tough-Pitch Copper Refinery Shapes. Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zirc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip and Rolled Bar. Standard Specification for Oxygen-Free Electrolytic Copper-Refinery Shapes. ASTM B122 -
- ASTM B170
- ASTM B322 ASTM B343
- Cleaning Metals Prior to Electroplating, Practice for.
  Standard Practice for Preparation of Nickel for Electroplating with Nickel.
- Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar.
  Standard Practice for Measurement of Metal and Oxide Coating Thickness by Microscopical ASTM B465 ASTM B487
  - Examination of a Cross-section.
- ASTM R545 Standard Specification for Electrodeposited Coatings of Tin.
- Standard Test Methods for Adhesion of Netallic Coating. ASTM B571
- ASTM B592 Standard Test Methods for Copper-Zinc-Aluminum-Cobalt or Nickel-Alloy Plate, Sheet, Strip, and Rolled Bar, Specification for. Standard Test Method for Porosity in Gold Coatings on Metal Substrates by Nitric Acid
- ASTM B735
- Vapor. Standard Test Method for Porosity in Gold Coatings on Metal Substrates by Paper ASTM B741
- Electrography.
- ASTM F15 Standard Specification for Iron-Nickel Cobalt Sealing Alloy.
- Standard Specification for Dumet Wire for Glass-to-Metal Seal Applications.
  Standard Specification for Iron-Nickel Sealing Alloy. ASTH F29
- ASTM F30

(Application for copies should be addressed to the American Society for Testing and Naterials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 <u>Order of precedence</u>. In the event of a conflict between the text of this cocument and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

# 3. DEFINITIONS

3.1 <u>Definitions</u>. This section is not applicable to this standard.

# 4. GENERAL REQUIREMENTS

4.1 <u>Preferred methods of assembly</u>. The preferred methods of assembly shall be in accordance with table II.

TABLE II. Preferred methods of assembly.

	I .	1							see 5.2				
omposition (see 5.1)	Underplating (see 5.2.1)	01	21	22	32	34	41	43	51	52	61	71	72
A	A		s,w	s,w	s	s	s	s	s	s	w	s	s
11	В	J	S,W	S,W		"	"		14	"	"		۱ *
	С				13		"	"	"	"			N
В	A		S,W	S,W	- "	l 11	"		"	11		"	
11	В		S,W	S,W		"	<b>"</b>		"	н	11		"
**	С				"	"	"	**	"	11	11	"	. "
C	Α				"	11	"	11			11		
11	В				"	11	"	11		"	1	"	
	1					**		"		"			
11	P				16	"	М.	**	"	"	и	"	
	) N	W			"	**		"		"	14		
D	A		S,₩	S,W	16	н .	"	"		"	44		
**	В		SW	S,W		"		"		"			٠.
**	C				14	"			"	"	11		۱ ۲
н	l P				и		"	**		**	14	"	١ •
11	N		1		н н					В			١ ١
E	A		S,W	S,W	11		"		"	**			
	В		SW	S,W			0		- 15	"			
	C		1-:-					H	"		- "		
	P							11			- 11		١,
	l N					- 11		111		н	- 11		
F	Ä		S,W	S,W				111		1 "			٠
	В		s,₩	S,W	"	1 11		n			н	12	•
	l c		-:-		- 11		**	н			н		
61	P				1 31		10	10			н	- 11	
G	A		S,W	s,w		11	- 11			- 11	11	10	
11	В		SW	s,w		11		- "		- 11			
	C		12:2	1		11	- 11	88		**	10	38	
	P				14			- 61	"	13		10	١.
Н	À		S.W	S,W	14				111				
ii	B		S,W	s,w	14				1 0	- 11	14	11	
	l č		12:2		**						.,	- 11	۱.
II .	ĕ	l	1	1			"			**			١,
0	N		1							86			
J	Ä		S,W	s,w						- 11			۱ ،
ň	l â		S,W	s,w	.,				10				١.
11	C		12:2	7.7.		- **	"			**			١,
ĸ	Ä		S,W	S,W	85	**					,,	15	١,
	8		S.W	S,W				1			14	11	١,
11	l č	l					11	1 "			"	11	١,
	P						"						١,
L	Ä	1				.,	"				- 31	11	١,
ii	B	l	1		.,		"				,,	- 11	"
	"	1	1	1		"		"			,,	11	Ι,
	p	l											
	N								1 44				Ι,
 M	1 "	1	1	1	"	"	"	1	, n	1	1 "		;
	Į	1	1	1	"	"	"	1	"	;;			1 :
ü	c		1				10			"			1
ä	P				::	:	1,4		;	;;	1 ::	;;	1 :
	l N				"	"		0	<u>"</u>	;;			1 :

TABLE II. Preferred methods of assembly - Continued.

		T				Fin	al fin	ish					
Composition	Underplating	01	21	22	32	34	41	43	51	52	61	71	72
N					s	s	s	s	s	s	u	s	s
11		1		1	n	l ü	111	- 11	11	н	10	11	0
11	l c				11	l H	11			"			
1)	Ī				н	Н н				11			
10	H	<u>.</u>				H		- 11	] 0				
W	Ä		S,W	S,W	**	н		- 11	10		н		
II	В		S,W	S,W	10	- 10	n .	и	- (4	- 11	10		
	1 -		10,0	-,-		н			68	11		н	
11	P				10					14			14
н	l N				1 **	н	.,				1 11		"
x	As specifie	l d in i	he ac	 quisiti	ion doc	ument	İ	1		1	l	l	1

- S = Solder
- W = Veld
- 4.2 <u>Solderability</u>. When specified in the acquisition document, leads shall meet the following solderability requirements:
  - 8. Discrete semiconductor devices: Test method 2026 of MIL-STD-750.
  - b. Microelectronics: Test method 2002 or test method 2003 of MIL-STD-883.
  - c. Other electronic and electrical component parts: Test method 208 of MIL-STD-202.
- 4.3 <u>Thickness</u>. When specified in the acquisition document, the thickness of the final firish and underplating shall be determined in accordance with ASTM 8487 or ASTM 8567.
- 4.4 <u>Adhesion</u>. When specified in the acquisition document, the adhesion of the final finish and underplating shall be determined in accordance with ASTA B571 or method 2025 of MIL-SID-883.
- 4.5 <u>Porosity</u>. When specified in the acquisition document, there shall be no evidence of porosity for final finishes 21, 22, and 61 when tested in accordance with ASTM B735 or ASTM B741.
- 4.6 <u>Workmanship in finishes</u>. All plating of primary finishes or underplating shall be deposited in such a way that the plating is applied to a clean, nonoxidized metal surface that is free from defects that will be detrimental to the utility, form, fit, function, or protective value of the finish. Where surface cleaning, deoxidation, activation, undercoating, etc., are used, the material or device so treated must proceed immediately to the primary finish process in order to maintain the ability to overplate effectively.

#### 5. DETAILED REQUIREMENTS

- 5.1 <u>Composition</u>. The specified lead composition (see 1.2.1.3) shall conform to the requirements of the applicable documents as follows:

  - R

  - Copper-iron-phosphorus-zinc alloy (194 alloy): ASTM B465 (see 5.2.1.4).
    Copper-iron-phosphorus-cobalt-tin alloy (195 alloy), 97 percent Cu, 1.5 percent Fe, 0.1 percent P, 0.8 percent Co, and 0.6 percent Sn (see 5.2.1.4).
    Copper (oxygen free): ASTM B170, grade 2.
    Copper-clad nickel-iron alloy (Dumet): ASTM F29.
    Copper-nickel-tin alloy (725 alloy), 88.2 percent Cu, 9.5 percent Ni, ard 2.3 percent Sn: ASTM B122. F

  - Iron-nickel alloy (52 alloy): ASTM F30 (see 5.2.1.2).
    Iron-nickel alloy (42 alloy): ASTM F30 (see 5.2.1.2).
    Copper-aluminum-silicon-cobalt alloy (638 alloy), 95.0 percent Cu, 2.8 percent Al, 1.8 percent Si, and 0.4 percent Co.

  - and U.s percent Co.
    Copper-zinc-aluminum-cobalt alloy (688 alloy): ASTM B592 (see 5.2.1.4).
    Iron-nickel-cobalt alloy: ASTM F15 (see 5.2.1.2).
    Copper, Electrolytic tough pitch: ASTM B5.
    Steel, nickel clad, 8 percent nickel clad by weight.
    Nickel: MIL-N-46025 (for ribbon leads) or MIL-N-46026 (for round-wire leads).
    Steel, copper-clad: ASTM B452 (except that the percent of conductivity shall be a minimum of 16 percent).
  - Other composition as specified in the acquisition document (see 5.2.1.4).
  - 5.2 Final finish. The final finish for leads (see 1.2.1.4) shall conform to the following as applicable:
  - 01 No finish. Lead is supplied with no external finish.
  - Gold plating, electrodeposited, in accordance with MIL-G-45204, type I. The thickness of the gold plating shall be 100 to 300 microinches. When specified, under-plating shall be in accordance with 5.2.1.1.
  - Gold plating, electrodeposited, in accordance with MIL-G-45204, type I. The thickness of the gold plating shall be 50 to 100 microinches. When specified, under-plating shall be in accordance with
  - 32 Tin-lead plating, electrodeposited, in accordance with MIL-P-81728. Composition shall be 50 to 70 percent tin (remainder lead). The thickness shall be 300 to 900 microinches (22.9 μm).
  - Fused (reflowed) tin-lead plating, electrodeposited, in accordance with MIL-Bi728. Composition shall be 50 to 70 percent iin (remainder lead). The tin-lead thickness after fusing (or reflow), shall not be less than 100 microinches (2.54 µm) at any single point. The average thickness of all points measured shall be 300 (7.62 µm) to 500 microinches (12.7 µm).

  - Acid-tin-leed plating, electrodeposited, in accordance with MIL-T-10727. Thickness shall be 300 (7.62 µm) to 500 microinches (12.7 µm). Minimum lead content shall be 3 percent. Matte-tin-lead plating, electrodeposited, in accordance with MIL-T-10727, type 1. The thickness shall be 300 (7.62 µm) to 500 microinches (12.7 µm). The matte-tin plating shall contain no more than 0.05 percent by weight codeposited organic material measured as elemental carbon. Minimum lead content shall be 3 percent.
  - Acid-tin-lead plating, electrodeposited, in accordance with MIL-T-10727. Thickness shall be 100 (2.54 μm) to 300 microinches (7.62 μm). Minimum lead content shall be 3 percent.
  - Matte-tin-lead plating (low organic content), electrodeposited, in accordance with MIL-T-10727, type I. The thickness shall be 100 (2.54 µm) to 300 microinches (7.62 µm). The matte-tin plating
  - type I. The thickness shall be 100 (2.54 µm) to 300 microinches (7.62 µm). The mattertin plating shall contain no more than 0.05 percent by weight codeposited organic material measured as elemental carbon. Minimum lead content shall be 3 percent.

    Not solder dip. The composition shall be Sn 60, Sn 63, or Sn 62 per Qq-5-571. The coating shall have a minimum thickness of 200 microinches as measured at the crest. Not solder dip finish may be used over final finish types 21, 22, 32, 34, 41, 43, 45, 46, 61, 71, and 72. When specified (see 1.2.1.5), electroless nickel underplating may be used in accordance with 5.2.1.3.

    Hot solder dip. The composition shall be Sn 60, Sn 63, or Sn 62 per Qq-3-571. Thickness shall be 60-200 microinches as measured at the crest. Hot solder dip finish may be used over final finish types 21, 22, 32, 34, 41, 43, 45, 46, 61, 71, and 72. When specified (see 1.2.1.5), electroless nickel underplating may be used in accordance with 5.2.1.5.

    Nickel nlating electrolensited in accordance with 5.2.1.5.
- Nickel plating, electrodeposited, in accordance with 0.221.3.

  Nickel plating, electrodeposited, in accordance with 0.221.3.

  The nickel plating, electrodeposited, in accordance with 0.221.3.

  Silver plating, electrodeposited, in accordance with 0.2-3.65, type II, grade B. Thickness shall be 150 (3.81 µm) to 350 microinches (8.89 µm).
- Silver plating, electrodeposited, natte, nonbrightened, in accordance with QQ-S-365, type I. Thickness shall be 150 (3.81 µm) to 350 microinches (8.89 µm).

- 5.2.1 <u>Underplating</u>. The underplating (see 1.2.1.5) shall conform to the following requirements:
- A Nickel, electrolytic.

  - 60 (1.52 μm) to 150 microinches (3.81 μm) thick. 100 (2.54 μm) to 300 microinches (7.62 μm) thick.
- 2 100 (2.59 µm) to 300 microinches (1.52 µm) thick.

  Nickel, electroless (not to be used on flexible or senirigid leads).

  1 100 (2.54 µm) to 200 microinches (5.08 µm) thick.

  2 50 (1.27 µm) to 120 microinches (3.04 µm) thick.
- C Copper electrodeposited.
  1 60 (1.52 μm) to 150 microinches (3.81 μm) thick.
  2 150 (3.81 μm) to 300 microinches (7.62 μm) thick.
  3 20 (0.50 μm) to 60 microinches (1.52 μm) thick.
- Falladium-nickel alloy. 1 50 (1.27 µm) to 100 microinches (2.54 µm) thick.
- to underplating.
- 5.2.1.1 <u>Gold plating</u>. A copper plus electrodeposited nickel or electrodeposited nickel underplating is required on all leads with gold plating as the final firish in accordance with MIL-C-14550.
- 5.2.1.2 Compositions F, G, and K. All leads with composition F, G, or K (see 5.1) shall have an underplating prior to final finish.
- 5.2.1.3 <u>Hot solder dip.</u> When specified for use under hot solder dip lead finish (see 5.2), the electroless nickel underplating shall be in accordance with MIL-C-26074. The thickness shall be as designated in 5.2.1.8.
- 5.2.1.4 <u>Compositions A. B. J. and X</u>. All leads with compositions A, B, J, or X (see 5.1) shall have a copper or nickel underplate of 100 microinches (2.54 μm) minimum.

#### A. NOTES

- (This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)
- 6.1 <u>Precaution</u>. Substitution of any type of lead for the existing leads on electronic component parts should not be made in a parts specification without first determining the effect of this substitution on the performance and solderability characteristics of the component part.
- 6.2 <u>Removal of gold plating before soldering</u>. Prior to equipment assembly, gold plated leads shall have the gold removed before soldering by single or double dipping into a flowing or nonflowing hot solder of sufficient volume to assure complete gold removal.
- 6.3 Passive nickel. If there is a delay after the application of nickel strike, where the nickel surface may have become passive, the nickel shall be reactivated followed by gold plating. Reactivation of the nickel surface should be in accordance with the appropriate section of the latest ASTM standards. (Reference: ASTM B322, Cleaning Metals Prior to Electroplating; and ASTM B343, Preparation of Nickel for Electroplating with Nickel.)
- 6.4 <u>Cross reference</u>. A cross reference of discontinued and superseding lead types appears in table III. Where MIL-SID-1276B designations are specified, the cross referenced MIL-SID-1276C designations may be used.

Su	Discontinued type		
,	MIL-STD-1276B		
Composition	Final finish	Underplating	
С	3		C (tin plated)
C	4		C (tin-lead plated)
D	2a	A1	D
F	2a	A1	F
K	2a	A1	K
N	1		N-1
N	2a	•••	N-2
N	3		N-3 (tin plated)
N	4	***	N-3 (tin-lead plated)

TABLE III. Cross reference of lead types.

MIL-STD-1276E

TABLE III. Cross-reference of lead types - Continued.

MIL·STD-127	50	MIL-STD-1276C
amposition		Composition
dipositivii	A	Not available
	В	Not available
	č	C
	D	D
	E	Not available
	F	l f
	G	G
	Н	Not available
	J	Not available
	K	K
	L	C <sub>1</sub>
	M	Not available
	N	N N
	W	1 9
	X	ļ x
Inderplating (sam	e as revision C with the ad	•
inal finish		Final finish
	01	1
	21	2a
	22	2ь
	31	3
	32	1 .4
	33	Not available
		Not available
	34	_
	51	5a
	51 52	56
	51 52 61	5b 6
	51 52	5b

- 6.5 <u>Cleanliness</u>. The last step in any component manufacturing process should be cleaning to remove residues such as fluxes.
- 6.6 <u>Supersession data</u>. Final finishes 31, 33, 35, and 36 are deleted, effective with revision E of this standard. These pure tin finishes may cause "tir whisker" growth leading to shorts and intermittents, especially in low power (5 mM and below) applications. For additional information on this matter, refer to ASTM BS45 (Standard Specification for Eletrodeposited Ceating of Tin). Replacement finish codes are 41, 43, 45, and 46 respectively, as described in 1.2.1.4, 5.2, and table IV.

TABLE IV. Supersession data for final finishes.

Superseded (old) finish code (MIL-STD-1276D)	Superseding (new) finish code (MIL-STD-1276E)
31	41
33	43
35	45
36	46

# 6.7 Subject term (key word) listing.

Final finish Plating Terminals Underplating

6.8 <u>Changes from previous issue</u>. Harginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

# CONCLUDING MATERIAL

Custodians: Army - ER Navy - EC Air Force - 85

Review activities: Navy - AS, SH Air Force - 17, 99 DLA - ES

User activities: Navy - CG, MC Preparing activity: Army - ER

Agent: DLA - ES

(Project 5999-0305)